299-E33-89 (A6897)

Log Data Report
(REVISED)

Borehole Information:

Borehole: 299-E33-89 (A6897)			**Site:** 216-B-8 Crib Tile Field		
Coordinates (WA State Plane)		**GWL (ft)[1]:** Not Reached		**GWL Date:** N/A[2]	
North	**East**	**Drill Date**	**TOC[3] Elevation**	**Total Depth (ft)**	**Type**
137,458.3 m	573785.0 m	Dec. 1947	643.8 ft	150	Unknown

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel Welded	2.25	8.625	8.0	0.3125	0	150

Borehole Notes:

The logging engineer measured the stickup using an engineer's tape. Stickup was measured as the distance between two engraved "X"'s at the top and base of the casing stickup; the TOC stickup is cut squarely. HWIS[4] is the source of the TOC elevation and coordinates. Casing bottom and total depth (TOC reference) are reported from information provided in Chamness and Merz (1993).

Logging Equipment Information:

Logging System:	Gamma 2B		**Type:** SGLS (35%)
Calibration Date:	11/01	**Calibration Reference:**	GJO-2002-287-TAR
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Logging System:	Gamma 1C		**Type:** High Rate Detector
Calibration Date:	02/07/02	**Calibration Reference:**	GJO-2002-309-TAR
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	Repeat	
Date	01/29/02	01/30/02	01/31/02	01/31/02	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	2.5	149.0	38.0	117.0	
Finish Depth (ft)	39.0	50.0	51.0	132.0	
Count Time (sec)	100	100	100	100	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	0.5	0.5	0.5	0.5	
ft/min	N/A	N/A	N/A	N/A	
Pre-Verification	B0069CAB	B0072CAB	B0073CAB	B0073CAB	
Start File	B0071000	B0072000	B0073000	B0073027	

Log Run	1	2	3	Repeat	
Finish File	B0071073	B0072198	B0073026	B0073057	
Post-Verification	B0071CAA	B0072CAA	B0074CAA	B0074CAA	
Depth Return Error (in.)	0	+1.5	0	0	
Comments	Fine-gain adjustment notes below.	Fine-gain adjustment notes below.	Fine-gain adjustment notes below.	Fine-gain adjustment notes below.	

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2	3		
Date	05/01/02	05/02/02	05/02/02		
Logging Engineer	Kos	Kos	Kos		
Start Depth (ft)	22.0	50.0	73.0		
Finish Depth (ft)	49.0	59.0	79.0		
Count Time (sec)	300	300	300		
Live/Real	L	L	L		
Shield (Y/N)	N/A	N/A	N/A		
MSA Interval (ft)	0.5	0.5	0.5		
ft/min	N/A	N/A	N/A		
Pre-Verification	AC010CAB	AC011CAB	AC011CAB		
Start File	AC010000	AC011000	AC011019		
Finish File	AC010054	AC011018	AC011031		
Post-Verification	AC010CAA	AC011CAA	AC011CAA		
Depth Return Error (in)	-0.5	NA	0		
Comments	No fine-gain adjustments.	No fine-gain adjustments.	No fine-gain adjustments.		

Logging Operation Notes:

SGLS and HRLS logging were performed in this borehole during January 2002 and May 2002, respectively. Zero reference is the top of casing for both the SGLS and HRLS. Logging was performed with a centralizer installed on the both the SGLS and HRLS sondes. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT verifier with SN 082, and pre- and post-survey verification measurements were acquired for the HRLS in the ^{137}Cs verifier SN 1013.

During SGLS logging, fine-gain adjustments were made to maintain the 1460-keV (^{40}K) photopeak at a pre-described channel. During logging run 1, 01/29/02, a fine-gain adjustment was made after file B0071000. During logging run 2, 01/30/02, fine-gain adjustments were made after files B0072000, -003, -006, -012, -037, and -141. During logging run 3 and the repeat run, 01/31/02, fine-gain adjustments were made after files B0073021 and -039.

The HRLS detector was in the unshielded housing during logging.

Analysis Notes:

Analyst:	Sobczyk	Date:	05/13/02	Reference:	MAC-HGLP 1.6.3, Rev. 0

This Log Data Report is a revision of the report originally issued 03/08/02. This revision includes high rate data analysis results that were not previously reported and replaces the original Log Data Report. Pre-run

and post-run verification spectra were collected at the beginning and end of each day. The recorded peak counts per second (cps) for the 609-keV, 1461-keV, and 2615-keV peaks were about 4 percent lower each day in the post-run verification as compared to the pre-run verification. The verification spectra were all within the control limits. The post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC Supervisor.

HRLS pre-run and post-run verification spectra were collected at the beginning and end of each log run. The spectra were within the acceptance criteria for the field verification of the Gamma 1C logging system (HRLS). The post-run verification spectra were used to determine the energy calibration for processing the data using APTEC Supervisor.

Log spectra for both the SGLS and HRLS were processed in batch mode using APTEC Supervisor to identify individual energy peaks and determine count rates. Concentrations were calculated in EXCEL (source files: G2BNov1.xls and glcfeb02.xls), using parameters determined from analysis of recent calibration data. Zero reference is the top of the casing. On the basis of the logging engineer's observations and Chamness and Merz (1993), the casing configuration was assumed to be one string of 8-in. casing with a thickness of 0.3125 in. to a log depth of 150 ft. A water correction was not needed.

Dead time corrections were required where the SGLS tool was not saturated. Dead time corrections were applied when dead time exceeded 10.5 percent. Dead time was greater than 40 percent in the intervals from 23.5 to 48.5 ft, 52 to 57.5 ft, and 74 to 77 ft. SGLS data from these regions are considered unreliable. At dead time greater than 40 percent, peak spreading and pulse pile-up effects may result in underestimation of activities. This effect is not entirely corrected by the dead time correction, and the extent of error increases with increasing dead time. The HRLS was utilized to obtain data where the SGLS dead time exceeded 40 percent.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net count rates.

Results and Interpretations:

^{137}Cs, which is a man-made radionuclide, was detected in significant amounts essentially throughout the borehole. Between 23 and 82 ft, ^{137}Cs activities exceeded 1,000 pCi/g. The maximum apparent ^{137}Cs activity was about 40,470 pCi/g at a log depth of 31.0 ft. A zone of ^{137}Cs contamination was detected near the ground surface (log depth 2.5 through 9.5 ft) with activities ranging from 0.2 to 54.4 pCi/g. The interval from 10 to 21.5 ft was the only portion of the borehole where ^{137}Cs was not detected.

Recognizable changes in the KUT logs occurred in this borehole. Above the zone of intense gamma-ray activity, apparent ^{40}K activities are about 12 pCi/g. Below the zone of highest gamma-ray activity (23 to 47 ft), apparent ^{40}K activities are about 17 pCi/g. The relatively high concentrations of ^{137}Cs below about 23 ft may correspond with the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2. Apparent increases in ^{232}Th activities of about 0.4 pCi/g occur at log depths of about 84 to 85 ft and 105 to 113 ft.

The plots of the repeat logs demonstrate good repeatability of the SGLS data for both the man-made and naturally occurring radionuclides.

Gross gamma profiles from Fecht et al. (1977) (attached) indicate significant amounts of gamma-emitting contamination reached the bottom of the borehole as early as 1963. Fecht et al. (1977) present log runs from 5/22/63 and 5/5/76. Short-lived radionuclides near the bottom of the borehole apparently had decayed away by 1976.

References:

Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNNL-8800, UC-903, Pacific Northwest Laboratory, Richland, Washington.

Fecht, K.R., G.V. Last, and K.R. Price, 1977. *Evaluation of Scintillation Probe Profiles From 200 Area Crib Monitoring Well*s, ARH-ST-156, UC-70, Atlantic Richfield Hanford Company, Richland, Washington.

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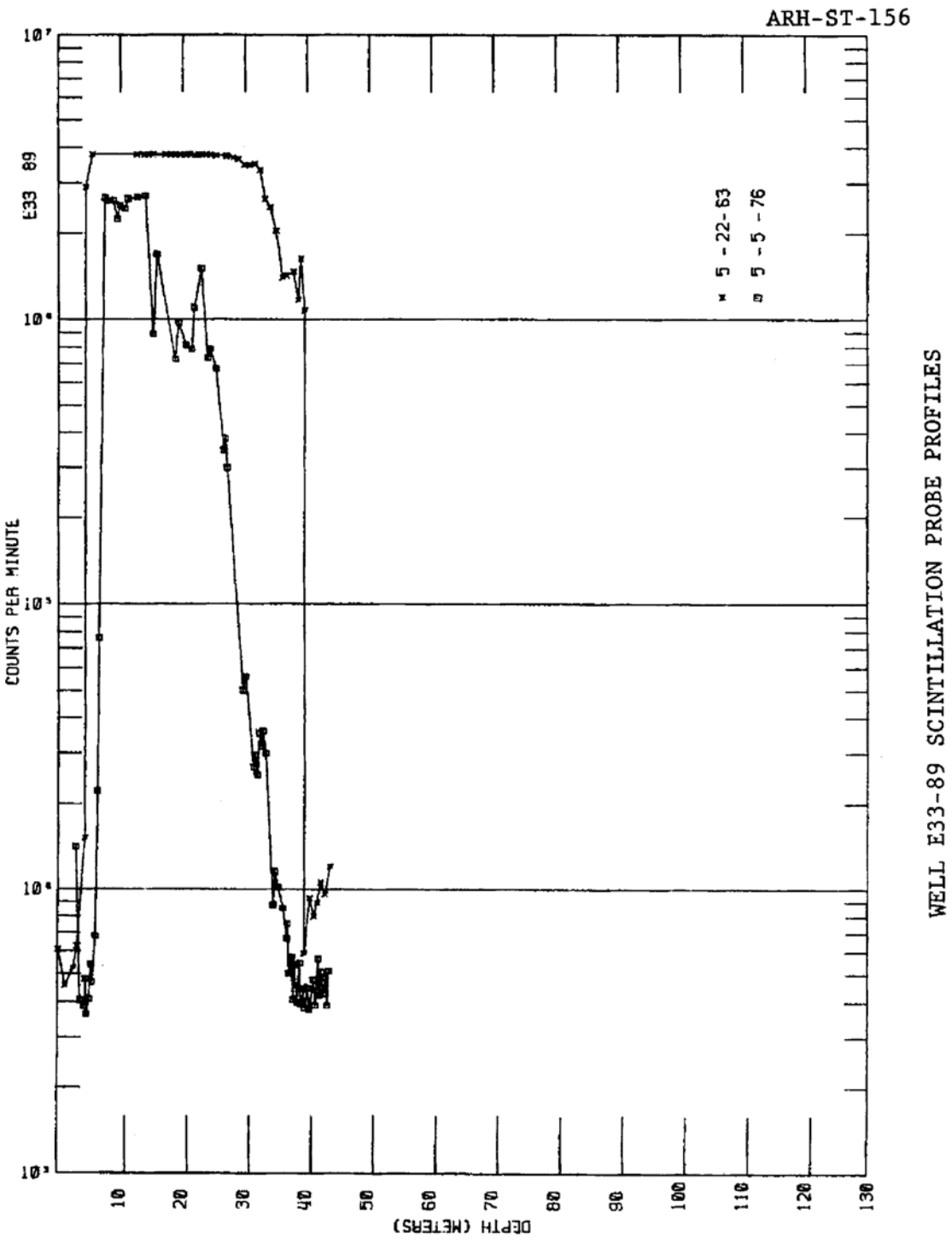
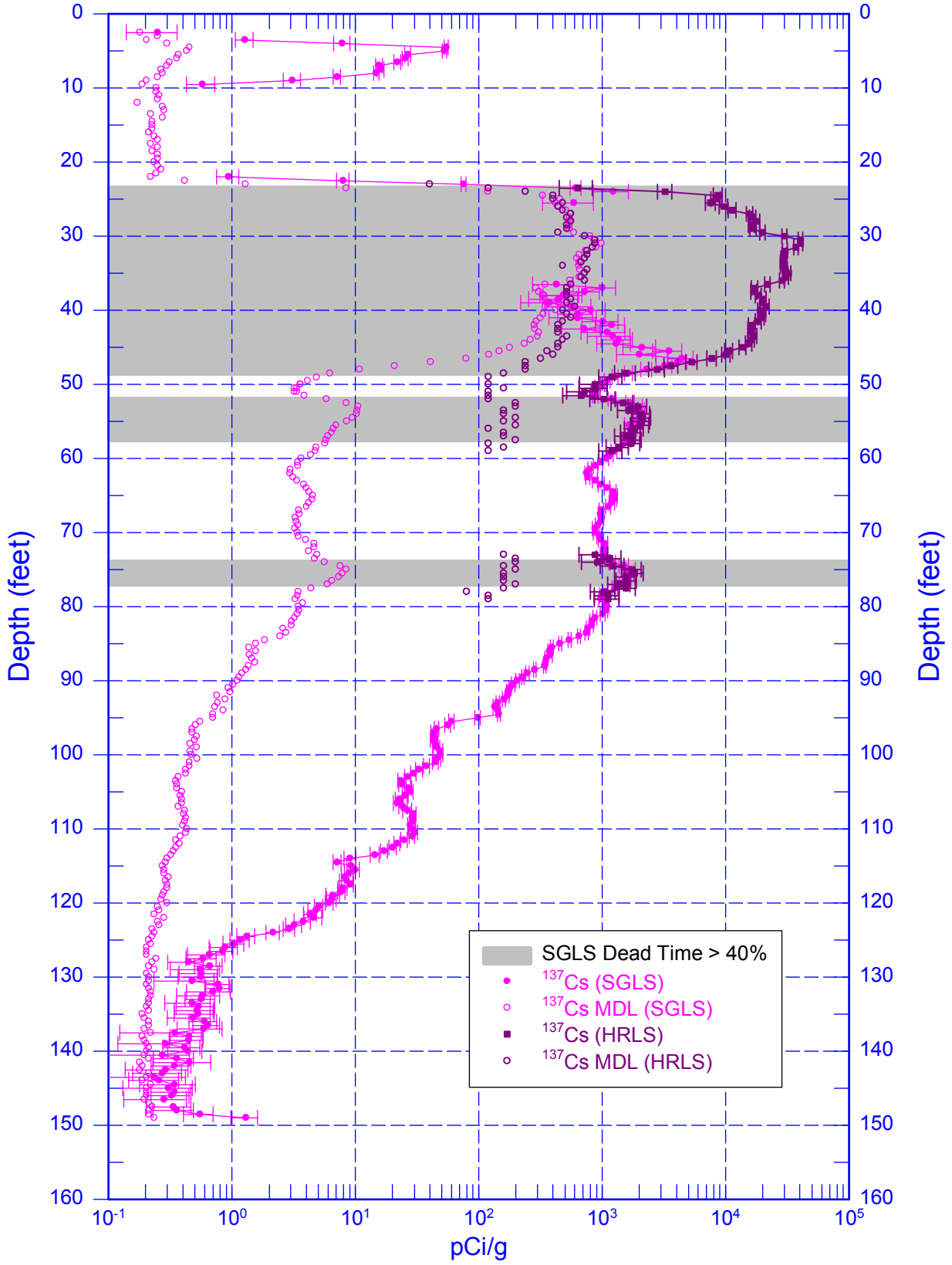
[1] GWL – groundwater level
[2] N/A – not applicable
[3] TOC – top of casing
[4] HWIS – Hanford Well Information System



(from Fecht et al. 1977)

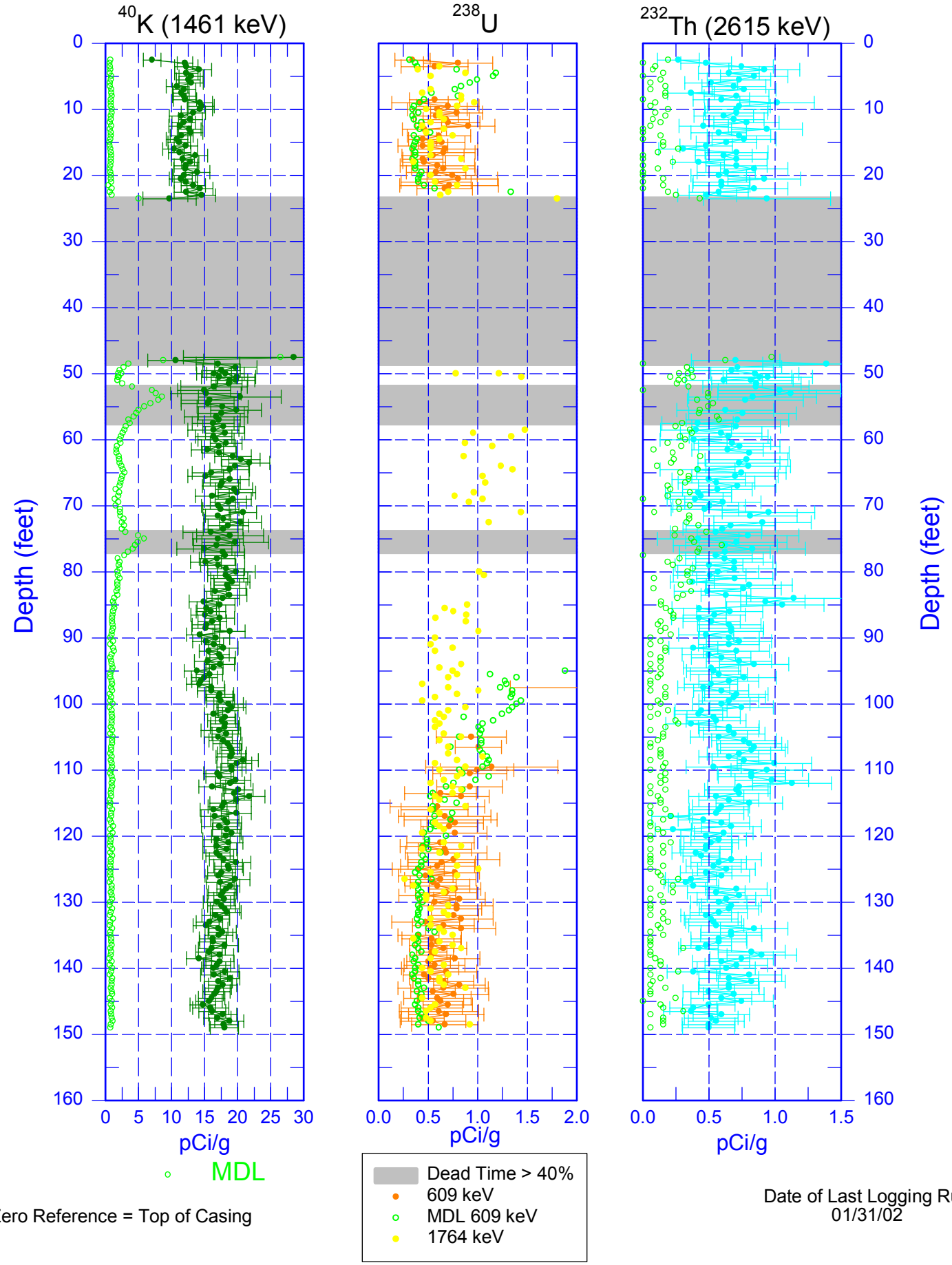
299-E33-89 (A6897)
Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run
05/02/02

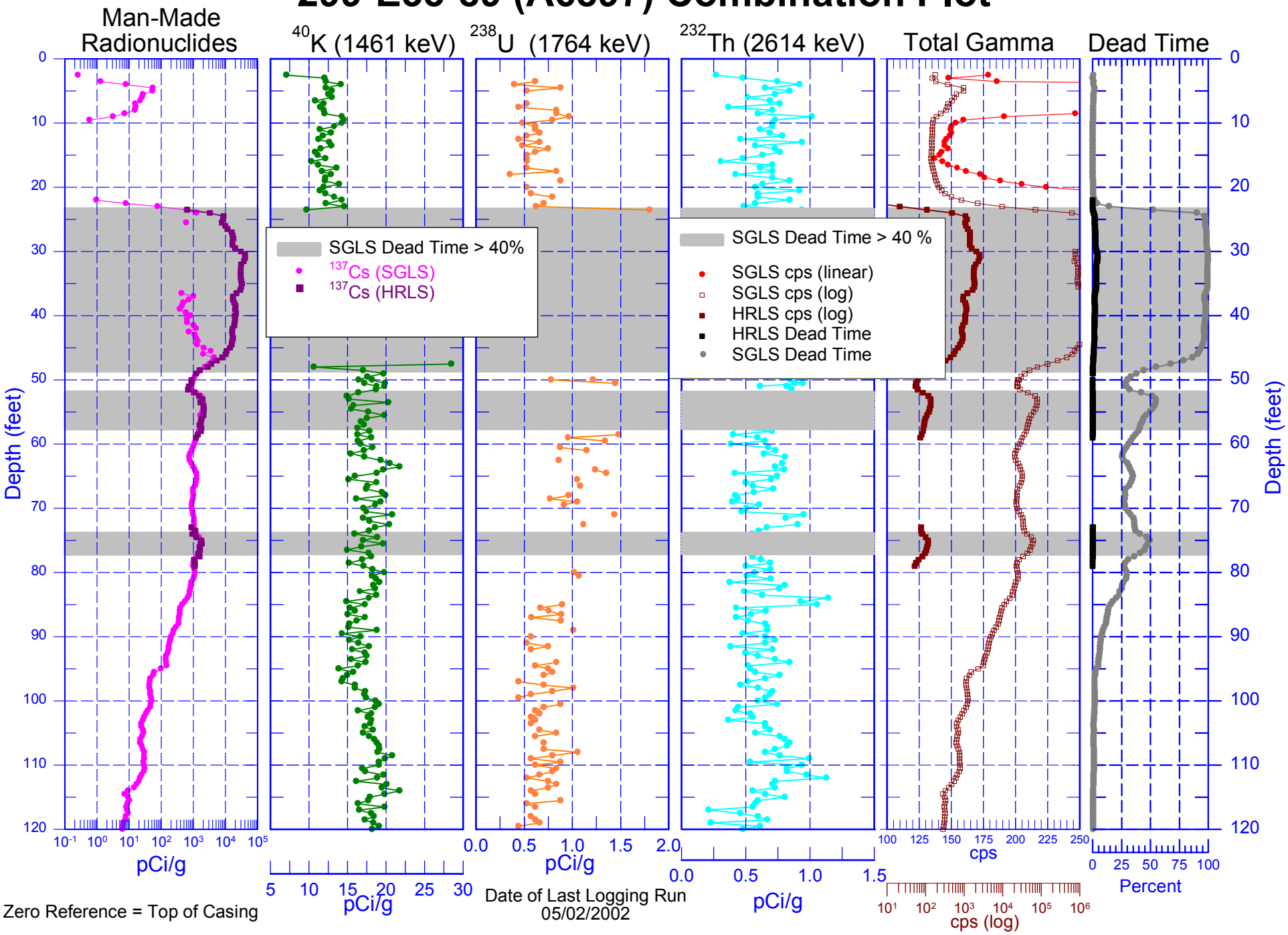
299-E33-89 (A6897)
Natural Gamma Logs



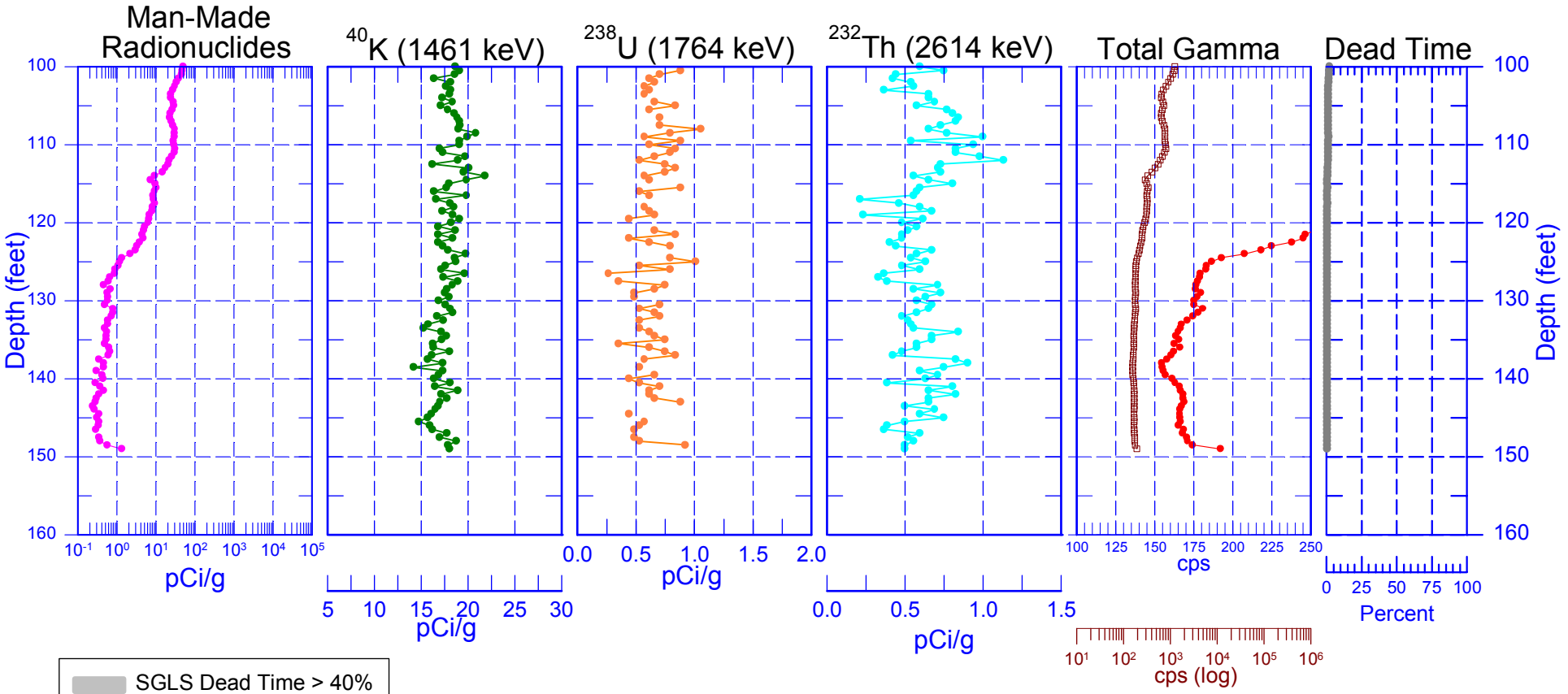
Zero Reference = Top of Casing

Date of Last Logging Run
01/31/02

299-E33-89 (A6897) Combination Plot



299-E33-89 (A6897) Combination Plot



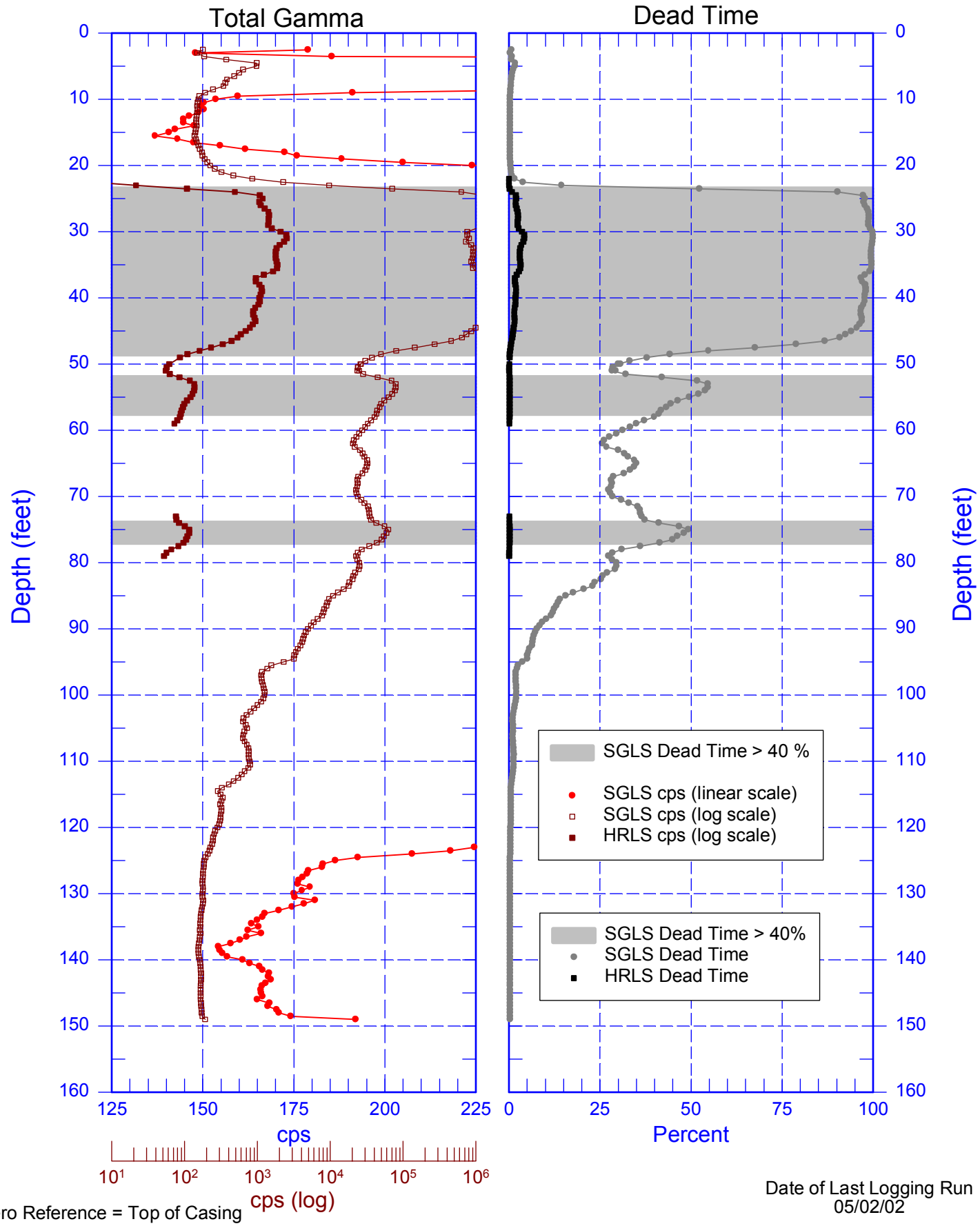
SGLS Dead Time > 40%
- ^{137}Cs (SGLS)
- ^{137}Cs (HRLS)

Zero Reference = Top of Casing

Date of Last Logging Run
05/02/2002

SGLS Dead Time > 40 %
- SGLS cps (linear)
- SGLS cps (log)
- HRLS cps (log)
- HRLS Dead Time
- SGLS Dead Time

299-E33-89 (A6897)
Total Gamma & Dead Time

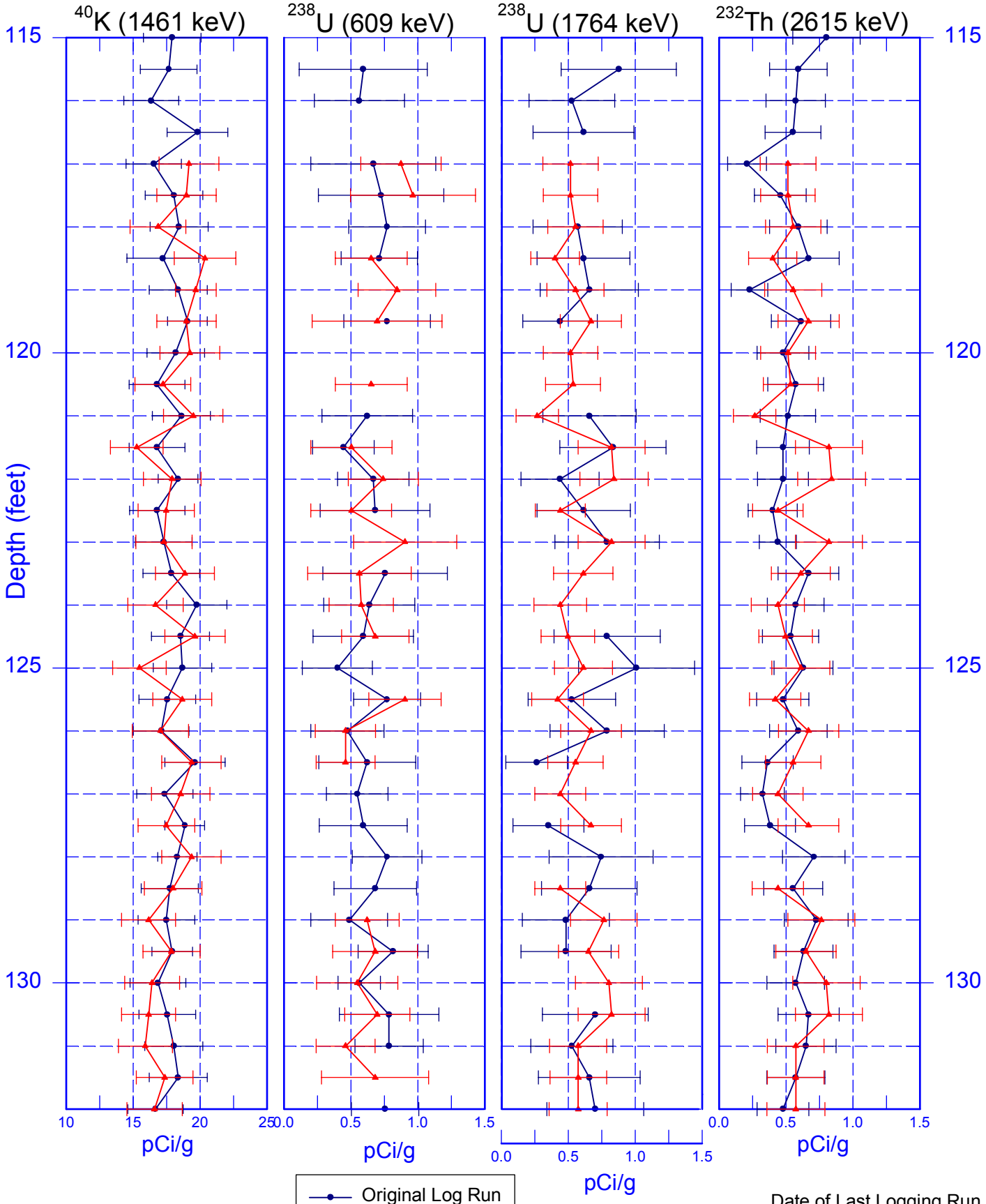


Zero Reference = Top of Casing

Date of Last Logging Run
05/02/02

299-E33-89 (A6897)

Repeat Section of Natural Gamma Logs

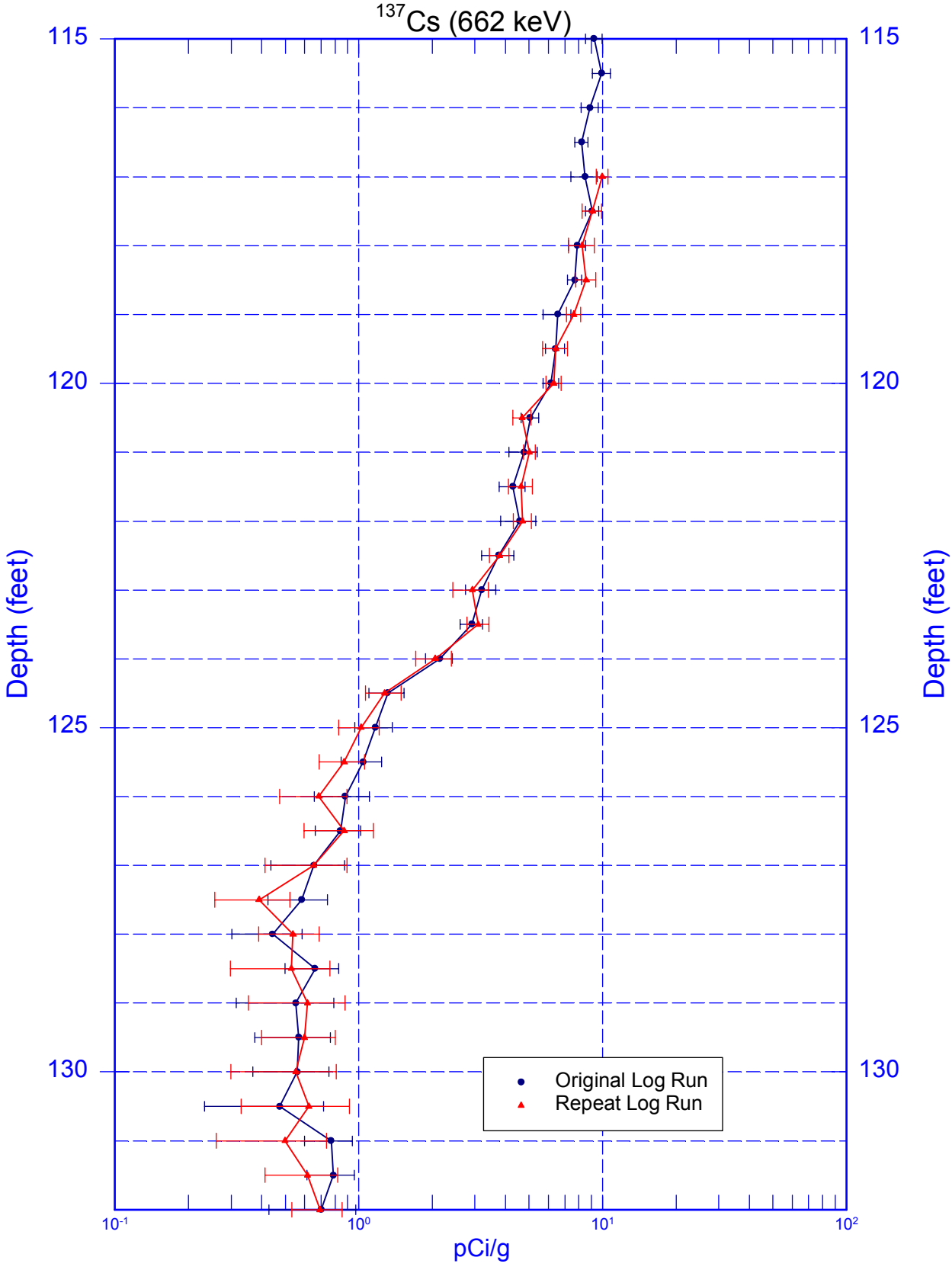


Zero Reference = Top of Casing

Date of Last Logging Run
01/31/02

299-E33-89 (A6897)

Repeat Section of Man-Made Radionuclides (117-132 ft)



Zero Reference = Top of Casing

Date of Last Logging Run
01/31/02